# Obesity and Public Policy

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## Abstract

There is a pressing need to reduce both the prevalence and impact of obesity. This review begins with a discussion of the roles of treatment and prevention. Two overriding issues, weight bias and the addictive nature of food, are covered because of their importance not only to the individuals affected but also to public policy. We then cover promising policy areas in which changes can be implemented to support healthy behaviors: school policy, food marketing, food labeling and packaging, and taxes on unhealthy foods. The roles of the food industry and federal, state, and local governments are also discussed.

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## INTRODUCTION

Articles on obesity traditionally begin with establishing it as a public health problem and include statistics on prevalence, morbidity, mortality, social suffering, and extreme healthcare costs. But with two-thirds of U.S. adults and one-third of children being overweight or obese, health professionals, elected leaders, and the public are now so acutely aware of the problem that such numbers are scarcely necessary, and attention can instead turn to solutions.

Most shocking is the global spread of the problem (Finucane et al. 2011). No country in the world is unaffected. Countries with vast populations such as India and China are expecting exponential rises in the prevalence of diabetes, nearly all of which will be attributable to weight gain and the behaviors that drive it (Yach et al. 2006).

There is a pressing need to reduce both the prevalence and impact of obesity. Finding the best solution, however, is a most challenging task because both medical and public health models have been proposed, both treatment and prevention have been emphasized, and in the public policy domain a wide variety of approaches are being pursued. Identifying what will have the most benefit, and at the least cost, is the critical task.

This review begins with a discussion of the roles of treatment and prevention and then outlines evolving obesity research with potentially important implications. Two overriding issues, weight bias and the addictive nature of food, are covered because of their importance to the individuals affected but also to public policy. Specific topics are then covered that we believe represent the areas where the most promising developments are occurring: school policy, food marketing, food labeling and packaging, and taxes.

## TREATMENT VERSUS PREVENTION

Many treatments have been used to address obesity (Wadden et al. 2011). Psychological treatments have been used in many forms, diets of every ilk have been promoted in popular books, commercial approaches such as Weight Watchers and Jenny Craig have existed for years, medications have been used, and various forms of surgery exist.

A review of treatments would be lengthy and would repeat what has been done elsewhere (Wadden et al. 2011). Vast numbers of studies have been done testing pharmacotherapy, behavior therapy, and various dietary approaches (Knowler et al. 2009, Wing 2010), and surgery (Sjostrom et al. 2007). Less has been done with popular diets, commercial programs, and self-help groups.

With the exception of surgery, which is expensive, carries some risk, and is suitable for only the most obese individuals, results of different treatments have been disappointing. Even with intensive behavioral interventions, weight losses are far less than patients desire, and relapse rates are high. Even if such treatments were more effective, their use on a broad scale would be limited because of cost. Treating obesity can be a humbling experience (Brownell 2010).

### Why Is Treatment Such a Challenge?

It is likely that a combination of factors contribute to the poor results of treatment. Chief among them are the strong biological defense of body weight that occurs as people restrict caloric intake (Rosenbaum & Leibel 2010) and the strong environmental pressures that affect eating. A number of changes occur in the body as people begin to lose weight, including changes in brain chemistry, metabolism, and the means by which the body regulates hunger and satiety. To make this point, one might compare two women, each weighing 135 pounds. If one had maintained that weight in a stable fashion for many years, and the other had weighed 180 pounds but reduced down to 135, they would be much different biologically and psychologically (Rosenbaum & Leibel 2010). The reduced person would have a physiological profile very much like a person at normal weight who was put on a highly restrictive diet and would exhibit a number of behavioral manifestations of a body wanting to replenish its energy stores.

Added to biological challenges is an environment rich with incentives and inducements to eat calorie-dense foods and to be physically inactive. Rising portion sizes, massive marketing of unhealthy foods, broad access to nutrient-poor and highly caloric foods, low prices for unhealthy options and higher prices for healthy ones just begin the list of factors that promote overeating. This explains, in part, why relapse in obesity treatment is so likely.

### The Better Path: Treatment or Prevention?

For the reasons stated above, obesity is a problem that must be both treated and prevented, but each approach will have different aims and benefits. Once established, obesity resists treatment, and because treatments are intensive and/or expensive, their utility as a public health measure is limited. Treatment does have a role, much as it does for difficult diseases such as lung cancer. People with obesity, as with lung cancer, deserve kind, caring, compassionate, and effective help. The need will never cease for research that improves the ability to deliver such help.

However, treating lung cancer is not the solution to reducing rates in the population—policies that decrease cigarette smoking have been highly effective. Treatments for obesity are unlikely to reduce prevalence—for every person successfully treated, many thousands are becoming obese because of an "obesogenic" environment. The means to having less obesity in the population, fewer people affected, lower morbidity and mortality and hence lower healthcare costs, is to prevent the problem. Treatment can be conceptualized as help for the afflicted, but not for addressing obesity as a national or global problem.

### What Type of Prevention?

At first glance, obesity is easy to explain. Energy (caloric) intake exceeds energy expenditure, excess calories get stored as body fat, and weight rises. As this imbalance occurs in more and more individuals, population rates of obesity increase. But hidden behind this simple reality is the key question of why caloric intake and expenditure are so badly out of balance and in so many people.

Biological vulnerabilities are part of the picture. If all humans ate and exercised exactly the same, weights would still differ. But biological vulnerabilities are only activated in the presence of a toxic environment that encourages high caloric intake and discourages physical activity. Biology cannot explain why obesity increases in the United States year after year and why every corner of the world is affected.

People are exposed to negative conditions that make unhealthy eating and physical inactivity the most likely outcome. These conditions can be referred to as defaults—a set of environmental drivers that strongly influence both intake and expenditure. As an example, children have poorer diets in schools when food such as sugared beverages and snack foods are available; when these foods are removed, diets get better (Story et al. 2009). Having junk foods in schools creates negative defaults, and having healthier foods presents better default conditions, which in turn will affect behavior and health.

Many studies have shown how powerful defaults can be. Economic research, for instance, has examined the number of people who enroll in pension plans. Many companies offer employees the free choice of enrolling or not, but some employers enroll employees as the default whereas others do not and employees must take the active step of opting in. By changing the default from not enrolling employees to enrolling them, participation moves from around 50% to nearly 100% (Choi et al. 2003).

Another impressive demonstration of defaults comes from data on the percentage of people in different countries who agree to be organ donors. Data have been collected comparing European countries where individuals are not organ donors by default but rather can opt in when they get a driver's license (as in the United States) with countries where individuals are donors by default but can opt out. Organ donor rates are 15% in countries when people must opt in compared to 98% in countries where the defaults are different (Johnson & Goldstein 2003).

Education is often mentioned as the solution to obesity, particularly by food companies. Even with a massive education budget, it is highly unlikely that pension enrollment could be taken from 50% to 100% and that organ donor rates could move from 15% to 98%. In contrast, changing a default can cost little or nothing and has been shown to accomplish a great deal. The following areas of research suggest changes that could alter the environment to encourage healthier choices.

## AN OVERRIDING AND OFT-IGNORED AREA: WEIGHT BIAS

Weight bias, stigma, and discrimination are often overlooked in discussions of obesity. These phenomena are important to the way obese individuals experience their weight, to the health and social consequences of excess weight, and to the way the nation addresses obesity as a public health issue.

Common stereotypes held toward overweight and obese persons include beliefs that they are lazy, incompetent, and lack willpower (Puhl & Brownell 2001). These attitudes result in discriminatory behaviors in interpersonal and institutional settings. It is estimated that the prevalence of weight/height discrimination has increased by 66% percent over the past decade, making it comparable in prevalence to racial discrimination (Andreyeva et al. 2008, Puhl et al. 2008). Despite these high discrimination rates, there are no federal laws protecting obese persons from discrimination based on weight, and very few local laws address weight bias (Pomeranz 2008). Thus, in addition to causing individual suffering inherent to experiencing stigma, weight bias creates personal and societal injustices for obese persons (Pomeranz 2008). Furthermore, the biased belief that obesity is a matter of personal responsibility, and therefore not of corporate or government responsibility, impedes policy advances for obesity intervention and prevention, thus posing a risk to public health (Barry et al. 2009, Brownell et al. 2010, Puhl & Heuer 2010).

In recent years, the detrimental impact of weight bias on the well-being of obese persons has been studied in more detail. Below we provide an overview of documented weight bias and its consequences in a variety of settings, along with advances in addressing this issue.

## Employment Settings

A meta-analysis examining weight discrimination in employment settings concluded that weight bias has a significant negative impact on evaluative employment outcomes such as hiring decisions, performance evaluations, and promotions, regardless of job type (Rudolph et al. 2009). The estimates of obese persons who experience weight-based discrimination at work range from 25% to 31%, and up to 54% of obese persons report being the targets of derogatory humor or receiving differential work-related treatment by coworkers or employers (Puhl & Heuer 2009). Wage penalties for obese employees range from 0.7% to 24%, regardless of the employees' socioeconomic characteristics, with female and severely obese persons facing the largest wage penalties and most frequent discriminatory experiences (Puhl & Heuer 2009). These findings are consistent with experimental work demonstrating a causal link between the weight of fictitious job applicants and employees and the quality of job outcomes that are assigned to them, including hiring decisions and salaries (Roehling et al. 2008).

## Educational Settings

Several studies have established a correlation between obesity and low educational attainment, particularly for women (Puhl & Heuer 2009). Although social and economic factors certainly contribute to this finding (Puhl & Heuer 2009), the relationship is strongest in schools with a low average body size of students, and it dissipates in schools in which obesity is more prevalent (Crosnoe 2007, Crosnoe & Muller 2004). These findings suggest that obese students fare worse in schools in which they are outcasts for their weight and indicate that weight bias may be damaging educational outcomes. Recent studies have found that high school students perceive being overweight as the primary basis for victimization at school (Puhl et al. 2011), and the odds of students skipping school and reporting that their grades are harmed due to weight-based teasing increase by 5% per teasing incident (Puhl & Leudicke 2012). Overweight students also report experiences of weight bias with teachers, including physical educators, from elementary school through college (Puhl & Heuer 2009, Puhl & Latner 2007). Teachers who hold antifat attitudes may treat obese students differently or fail to properly intervene with weight-based bullying by peers (Puhl & Heuer 2009), creating a negative learning environment that may impair academic performance for these stigmatized students.

## Interpersonal Relationships

Over the past decade, reports of interpersonal experiences of stigma have increased more than

have reports of stigma in institutional settings (Andreyeva et al. 2008). Obese women are perceived as less desirable dating or sexual partners, are less likely to date than are nonobese peers, and may experience more negative relationship satisfaction than nonobese women experience, although evidence of this last finding includes mixed results (Carr & Friedman 2006, Puhl & Heuer 2009). Family members have been cited as the most frequent source of interpersonal weight stigma: Mothers are the most commonly reported source of stigma, followed by fathers, sisters, brothers, sons, and daughters (Puhl & Brownell 2006).

## Healthcare Settings

Weight bias is particularly prevalent in healthcare settings, with studies documenting antifat attitudes among physicians, nurses, medical students, and fitness professionals and dietitians (Puhl & Heuer 2009). These attitudes include blaming obese patients for their weight and related health problems, leading healthcare professionals to openly denigrate obese patients, spend less time with them, and provide less preventative care (Mold & Forbes 2011, Puhl & Heuer 2009). Several studies have documented patients' awareness of this bias, with reports of inappropriate comments from doctors about weight, disrespectful treatment, and ambivalence toward patient needs (Mold & Forbes 2011, Puhl & Heuer 2009). Although not all obese patients describe stigmatizing experiences with healthcare providers, weight bias among these professionals may partially explain the concerning findings that obese persons avoid medical care and are less likely than nonobese persons to utilize health resources for preventative care (Mold & Forbes 2011, Puhl & Heuer 2009).

Weight bias among healthcare providers can be considered especially problematic because of the detrimental physical and psychological health consequences of experiencing weight-related stigma. Evidence supports links between experiences of weight-based victimization and low self-esteem, depression, body dissatisfaction, and suicidal ideation and attempts among adolescents and adults (Puhl & Heuer 2009, Puhl & Latner 2007). In addition, weight stigma has been linked to negative cardiovascular health outcomes for adolescents, such as high blood pressure, potentially due to the role of stigma as a chronic stressor (Puhl & Latner 2007). Consistent with this finding, a recent study found that the negative relationship between body mass index and health-related quality of life in adults is partially mediated by weight self-stigma (Lillis et al. 2011).

Several studies have also established a relationship between weight stigma and behaviors that contribute to disordered eating and obesity. Weight-related teasing is associated with bulimic behaviors, binge eating, and other unhealthy weight-control behaviors among overweight children, adolescents, and adults (Hayden-Wade et al. 2005, Neumark-Sztainer et al. 2002, Puhl & Heuer 2009). Furthermore, recent evidence suggests that weight-based victimization may lead adolescents and adults to avoid physical activity (Puhl & Latner 2007, Vartanian & Novak 2011, Vartanian & Shaprow 2008), and many adults react to weight bias by refusing to diet (Puhl & Heuer 2009).

These findings are significant because they contradict the common argument that weight stigma is somehow beneficial owing to its potentially motivating influence on obese persons to lose weight (as cited in Puhl & Heuer 2010), instead revealing that stigma actually impedes healthy weight loss. Given the negative health impact of weight bias, it is important for healthcare providers to be aware of and sensitive to this issue in order to help patients cope in adaptive ways rather than contribute to the stigmatizing experiences that worsen obesity and overall health (Puhl & Brownell 2006).

## Media

Stigmatizing portrayals of obese persons frequently appear in movies, television shows, and commercials geared toward children and adults (Puhl & Heuer 2009). The news media represent a particularly prominent source of

stigmatizing content: Obesity is often framed as an issue of personal responsibility with an emphasis on individual blame, and the majority of images accompanying news stories portray obese persons in an undignified and slovenly manner (Heuer et al. 2011). This latter finding is of concern owing to evidence suggesting that images alone communicate prejudices and influence public attitudes, regardless of the content of the news stories accompanying the images (as cited in Heuer et al. 2011). Indeed, recent experimental studies suggest that stigmatizing images of obese persons, in comparison with nonstigmatizing images, elicit stronger antifat attitudes from the public (McClure et al. 2011, Pearl et al. 2011).

## Advances in Addressing Weight Bias

Along with documenting the existence of weight bias and its impact, researchers have explored ways to help obese persons who are targeted by this stigma, beginning with coping skills. Evidence suggests that for women, employing coping strategies marked with negativity, such as insulting the offending party, is related to higher levels of depression and distress, whereas strategies such as positive self-talk and seeking social support are related with healthier outcomes (Puhl & Brownell 2006). In men, coping through self-acceptance has been found to be correlated with higher self-esteem, whereas coping with avoidance, negative self-talk, or crying are associated with low self-esteem (Puhl & Brownell 2006).

In addition to coping skills for individuals, strategies for reducing weight bias at institutional levels have been proposed and tested. One such strategy draws upon the attribution-value theory of antifat attitudes, which asserts that obese persons are perceived as culpable for their condition and consequently assigned negative attributes (Crandall et al. 2001). Multiple studies have documented the public's strong belief that weight is controllable, along with this belief's association with attribution of negative personality characteristics, social rejection, and lower helping tendencies toward obese persons (Puhl & Brownell 2003). Therefore, it is possible that providing the public with medical information about the complex causes of obesity could reduce blame and the associated negative attributions. Although this intervention seems to lead to more positive attitudes among young children, the attitudes of older children and adolescents are not as easily altered (Anesbury & Tiggemann 2000, Bell & Morgan 2000). Utilized in educational settings, this information-based approach has been found to reduce negative attitudes among educators, although curricula-based school interventions for teachers and students focusing on acceptance promotion and teasing prevention are also necessary to improve the school environment (Puhl & Latner 2007).

Another more promising approach is based on social consensus theory, which states that people's biases are influenced by the perceived biases of others (Puhl & Brownell 2003). Experimental studies have demonstrated that college students report more positive attitudes toward obese persons when given false favorable consensus feedback from other students (Puhl & Brownell 2003), supporting the need to focus on interventions that reduce perceptions of bias. Because frequent stigmatizing portrayals of obese persons in the media may exaggerate perceptions of others' antifat attitudes (Puhl & Brownell 2003), increasing positive media portrayals of obese persons and reducing the use of stigmatizing images may be one method to diminish these exaggerated perceptions and weaken public bias (McClure et al. 2011).

Although it is encouraging that weight bias has begun to receive more empirical attention in recent years, our understanding of its extent and impact is still limited. Further research is needed in order to develop effective strategies for addressing this problem as well as to build support for legislation and policy interventions that prevent and protect obese persons from weight-based discrimination.

# FOOD AND ADDICTION

The addictive potential of ultraprocessed foods is a possible contributor to obesity with

potentially significant implications for policy. There is considerable interest in this issue due in part to the quickly evolving nature of the food supply in a manner that mirrors the creation of drugs of abuse (Gearhardt et al. 2011b, Gold et al. 2009). For example, the coca leaf is a plant with mild stimulant properties, but it has little to no addictive potential in its naturally occurring form (Hanna & Hornick 1977). Yet, when the coca leaf is processed into a more potent form (e.g., powder) that can be quickly absorbed into the bloodstream, it becomes the highly addictive drug cocaine (Verebey & Gold 1988).

In an effort to increase sales, food companies have augmented the reward value of their products by manipulating fat, sugar, salt, food additives, flavor enhancers, and caffeine (Cocores & Gold 2009, Gearhardt et al. 2011a, Monteiro et al. 2011). The resulting products are significantly more palatable, plus the removal of protein and fiber results in quicker absorption of ingredients, such as sugar, into the bloodstream (Gearhardt et al. 2011a). Thus, minimally processed foods (e.g., fruits, vegetables) may have little or no addictive potential, but ultraprocessed foods (e.g., sugar-sweetened beverages, French fries) may begin to resemble addictive substances.

Obesity rates have risen in tandem with the flood of ultraprocessed foods into the environment (Brownell 2005). The obesity epidemic has highlighted a number of behavioral similarities between excess food consumption and addictive disorders (for a review, see Gearhardt et al. 2009a). Both obesity and addiction are marked by continued use of a substance despite emotional and physical problems as well as elevated rates of relapse. Further, an inability to reduce consumption despite a strong desire to do so is a hallmark of both obesity and addiction. Obesity and addiction also share similar comorbidities (e.g., mood/anxiety disorders) (Grant et al. 2004, Simon et al. 2006), and similar psychological factors play a role in both disorders, such as intense cravings, impulsivity, and emotionally triggered consumption (Gold et al. 2003). The similarities between processed foods and addictive substances, as well as the behavioral parallels between obesity and addiction, inspired a burst of research on the topic of food and addiction.

## Animal Research

Impressive support for the addictive properties of highly processed foods comes from animal models of eating behavior. Avena and colleagues (2008) found that rats given intermittent access to sugar begin to exhibit hallmarks of addiction. After repeated exposure to sugar, rats ignore their typical chow and binge on a sugar solution. The quantity of sugar consumed in each binge quickly grows, which is interpreted as increased tolerance to the effects of sugar. Furthermore, rats display signs of withdrawal, such as teeth chattering, anxiety, and agitation, when sugar is removed from their diet or naloxone is administered to block the opioid effect of sugar consumption (for a review, see Avena et al. 2008).

In line with this research, rats given a diet of ultraprocessed foods high in added sugar, fat, and salt (e.g., cookies, cheesecake, bacon) relative to rats maintained on chow are more likely to seek out foods high in added fat/sugar despite the receipt of electric foot shocks (Johnson & Kenny 2010). Moreover, rats on the ultraprocessed diet also exhibit neurobiological changes implicated in addictive behaviors, such as reduced $D_2$-like dopamine receptor (Johnson & Kenny 2010). In sum, these findings support the concept that certain foods, especially processed foods high in added fat, sugar, and salt, may be capable of triggering an addictive process.

## Neuroimaging Research

The possibility of addiction to ultraprocessed foods has also been supported by neuroimaging research. In line with the animal evidence, food consumption and drug use appear to activate similar neurocircuitry, especially the mesolimbic dopaminergic system and endogenous opioid system (for a review, see Volkow & O'Brien 2007). Moreover, addicts and obese participants both appear to have reduced $D_2$-like dopamine

receptor availability, which is thought to reflect either a pre-existing reward deficiency that results in excessive consumption or a neuroadaptation caused by the frequent consumption of an addictive substance (Wang et al. 2001).

Obese and substance-dependent individuals also appear to have greater reward-related activation in response to food cues and drug cues, respectively. For example, obese relative to lean participants exhibit greater activation in brain regions implicated in drug craving [i.e., the orbitofrontal cortex (OFC), amygdala, anterior cingulate cortex (ACC), and striatum] in response to food cues (Rothemund et al. 2007, Stoeckel et al. 2008). In contrast, obese and substance-dependent participants show less activation in brain regions implicated in reward (i.e., dorsal striatum, medial OFC) during consumption of food and drugs, respectively (Stice et al. 2008a,b; Volkow et al. 2007). This pattern of hypoactivation may be reflective of the reduced $D_2$-like dopamine receptor availability associated with both disorders (Stice et al. 2009). Thus, similar neurobiological mechanisms appear to play a role in obesity and addiction.

## Obesity and Food Addiction

Although the links between obesity and addiction provide strong support for the concept of potentially addictive foods, it is unlikely that all obese individuals are addicted to food. Obesity is attributed to a number of factors in addition to excess food consumption, like physical inactivity and thyroid dysfunction (Marcus & Wildes 2009). Thus, one can be obese for reasons other than compulsive food consumption. Furthermore, excess consumption of an addictive substance is not equivocal to the presence of substance dependence. For example, approximately 40% of college students report binge drinking (O'Malley & Johnston 2002), but only 6% meet the criteria for alcohol dependence (Knight et al. 2002). Therefore, consumption of potentially addictive foods in a manner that increases body weight would not necessarily be indicative of a food addiction. Finally, compensatory behaviors, such as restriction and compulsive exercise, may result in a normal body weight despite the presence of an addictive relationship with food.

To more precisely operationalize food addiction, we developed the Yale Food Addiction Scale (YFAS) (Gearhardt et al. 2009b), which translates the *Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition, Text Revision* (DSM-IV-TR) (Am. Psychiatr. Assoc. 2000) criteria for substance dependence to relate to consumption of highly processed foods (e.g., chocolate, French fries). The YFAS provides two scoring options: (*a*) a "symptom" count that ranges from 0 to 7 or (*b*) a dichotomous "diagnosis" of food addiction based on the requirements for a diagnosis of substance dependence (i.e., three or more symptoms plus clinically significant impairment or distress). In the preliminary validation of the YFAS in a nonclinical sample, 11.4% of participants met a diagnosis of food addiction, and the YFAS had adequate internal consistency, as well as convergent, discriminant, and incremental validity (Gearhardt et al. 2009b).

Further research has also supported the utility of the YFAS. In a sample of obese patients with binge eating disorder, 57% of participants met the food addiction diagnosis, and these participants were more likely to exhibit elevated levels of depression, negative affect, and emotion dysregulation; eating disorder psychopathology; and lower self-esteem. Moreover, the YFAS was the only measure to significantly account for the frequency of binge eating episodes (Gearhardt et al. 2011c). Evidence of food addiction as measured by the YFAS was also related to patterns of neurobiological activation linked to other addictive behaviors. Specifically, participants with higher food addiction symptoms exhibited greater activation in brain regions implicated in craving and wanting in response to palatable food cues (i.e., ACC, medial OFC, and amygdala) and decreased activation in brain regions linked to the ability to inhibit oneself from responding to rewarding stimuli (i.e., lateral OFC) (Gearhardt et al. 2011d). Interestingly, participants with

elevated food addiction symptoms were lean as well as obese, which highlights the importance of examining behavioral indicators of addictive eating behavior in combination with weight classification.

## Importance of Focusing on Food and Addiction

In addition to possibly providing information about the cause of obesity and the usefulness of addiction-focused treatments, evidence of the ability of certain foods to trigger an addictive process may have important policy implications. A focus on the impact of potentially addictive foods will be essential in determining the public health impact of food addiction. As with other substances, much of the societal cost will be due to widespread subclinical problems. For example, the lifetime rate of alcohol dependence hovers around 10% (Am. Psychiatr. Assoc. 2000), but alcohol use is the third-leading cause of preventable death (Mokdad et al. 2004). Similarly, in the case of potentially addictive foods, a relatively small number of individuals will likely meet the clinical threshold for food addiction, but a much larger number may experience an addictive process to a degree that will result in subclinical problems that impact their health (Gearhardt et al. 2011b). In the case of other addictive substances, such as tobacco, the most effective tactic in reducing the public health cost has been to apply substance-focused policies. For example, increased taxation of cigarettes, reduced cigarette advertising to minors, and diminished access to nicotine products were successful approaches in reducing cigarette smoking in the United States (Brownell & Warner 2009). Thus, if highly processed foods can trigger a similarly addictive process, application of these strategies to the current food environment may be essential in combating the obesity epidemic.

# SCHOOL FOOD ENVIRONMENT

The prevalence of overweight and obesity in youth is increasing at an alarming rate. Nearly one-third of the youth in the United States are now overweight, the prevalence of BMI for age at or above the 95th percentile (obesity) has tripled since 1980 and is now estimated at 17% (Ogden et al. 2010). Overweight and obesity in youth are associated with hypertension, hyperlipidemia (Freedman et al. 2007), and impaired glucose tolerance (Dietz 1998). Furthermore, youth with high BMI frequently become obese adults (Serdula et al. 1993). In response to this epidemic, the White House issued a Task Force on Childhood Obesity, wherein they specified healthy food in schools as one of the primary areas for preventing childhood obesity (White House Task Force on Childhood Obesity 2010).

The importance of the school environment in the prevention and reduction of childhood obesity is clear. More than 95% of American youth aged 5 to 17 are enrolled in school (Story et al. 2009), and a substantial portion of a child's daily calories is estimated to be consumed at school (Gleason & Suitor 2001). Additionally, children spend more time in school than in any other environment away from home (Story et al. 2009), and schools shape students' eating and physical activity behaviors both explicitly and implicitly. The school environment provides a rich opportunity for the development and implementation of nutrition, physical activity, and wellness policies.

## School Food Policies

One major influence on nutrition in schools comes from federal school lunch and breakfast programs. Approximately 31 million children in the United States participated in the National School Lunch Program in 2009, and 11.1 million participated in the school breakfast program (Badesch et al. 2010, Guill et al. 2010). The foods offered in these programs are federally regulated and must meet certain guidelines to qualify as a reimbursable school meal. For instance, school lunches must provide at least 30% of a child's calories for the day and must contain one serving of milk, one meat or meat substitute, one grain, and either two fruits,

two vegetables, or one of each. The only strict limitation, however, is that fewer than 30% of the calories may be from fat, and fewer than 10% of calories may be from saturated fat. Despite these relatively lax standards, two-thirds of school lunches exceed the maximum amount of fat and saturated fat (Crepinsek et al. 2009), and 99% of all school meals fail to meet the federal requirements due an excess of saturated fat (Burghardt et al. 1995). As a result, 80% of students who participate in school food programs have excess saturated fat intake, and 92% of students consume excess sodium (Clark & Fox 2009).

The second category of foods available in schools is "competitive food" or food sold outside of the formal meal programs. These alternative options may come from vending machines, fundraisers, school stores, or a la carte items offered during lunchtime. Competitive food options are increasingly common; in fact, in a survey of public schools between 2004 and 2005, 73% of elementary schools, 97% of middle schools, and 100% of high schools had one or more sources of competitive food, including vending machines, school stores, or snack bars (Fox et al. 2009). Furthermore, one-third of National School Lunch Program participants, and nearly half of nonparticipants, consume at least one competitive food in a given day (Gordon & Fox 2007). The most commonly offered a la carte options are ice cream, chips, baked goods, and juice drinks (Lytle et al. 2006); only 4% of a la carte offerings are fruits and vegetables (Story et al. 2006). As a result, students on average consume more than 150 calories of nutrient-poor, energy-dense foods in a given day from a la carte vendors (Gordon & Fox 2007).

Vending machines are also increasingly common in schools; in fact, 27% of elementary schools, 80% of middle schools, and nearly 100% of high schools have vending machines available to students (Fox et al. 2009) that most frequently sell sugar-sweetened beverages and high-fat salty snacks. The only regulation currently in place for competitive foods is that the vendor may not sell foods of minimal nutritional value, which precludes the sale of only a few foods, such as soft drinks, gum, and certain candies. Foods that are currently allowed include noncarbonated sugar-sweetened beverages (such as sports drinks), cookies, ice cream, and potato chips.

These a la carte items likely have a deleterious impact on students' eating behaviors and health. Students with access to a la carte food items report lower consumption of fruits and vegetables and higher caloric intake from total as well as saturated fat (Burghardt et al. 1995, Kubik et al. 2003, U.S. Dep. Agric. Food Nutr. Serv. 2011). The availability of a la carte snacks and beverages is also associated with greater BMI among students; in fact, the BMI of students increases 10% for every additional food practice (e.g., vending machines, snack bars, bake sales, or foods used as a reward in the classroom) permitted inside the school, which indicates that daily exposure to nutrient-poor, energy-dense foods may result in overconsumption (Kubik et al. 2003).

## Physical Activity in Schools

There are numerous benefits to physical education in schools: Physical activity in youth decreases the likelihood of becoming an overweight adult (Menschik et al. 2008), improves physical fitness, and may also be associated with greater learning efficiency (Story et al. 2009). Although the majority of states have mandated physical activity in schools, there is no federal law requiring schools to do so. As a result, the amount of physical activity that the majority of school-aged children receive is remarkably low. For instance, only 2% of high schools, 8% of middle schools, and 4% of elementary schools require daily physical education (Story et al. 2009). Only 10 states have specified a requirement for the number of minutes spent in physical education for high schools, and only seven states have done so for middle schools (Story et al. 2009). Furthermore, there is no standard for the quality of physical activity in schools; subsequently, only a handful of states have specified that a certain amount of time must be spent

engaging in "moderate" to "vigorous" physical activity (Story et al. 2009). Fewer than half of all states require or recommend any physical education assessment, such as skills performance or fitness levels (Lee et al. 2007), and only 11 states have enacted policies to assess students' physical fitness (Story et al. 2009).

## School Nutrition Education and Wellness Policies

Although 70% of states and 83% of school districts require nutrition education, the amount of time students actually spend learning about diet and nutrition is limited. The median number of hours spent per year in such courses is five for middle school and high school and only 3.4 for elementary school. It is promising, however, that schoolteachers have indicated they want more training in and opportunities to teach nutrition education and dietary behavior (Kann et al. 2007).

One specific policy that has received recent attention is the BMI report card, which has been suggested as a means to reduce rates of childhood obesity. Through this assessment, children at risk for obesity would be identified, and parents would be notified and encouraged to modify the child's eating and activity patterns (Nihiser et al. 2009).

There is substantial debate whether this practice might prove iatrogenic and subsequently increase stigma toward overweight youth or encourage unhealthy dieting practices (Ikeda et al. 2006). To date, little empirical evidence has been collected on the potential efficacy or harmfulness of BMI report cards. One such study found that three years following the initiation of statewide BMI report cards in Arkansas, the rates of overweight and obesity among youth had not increased, in contrast to rising rates elsewhere. Furthermore, there were no observed increases in unhealthy weight control practices such as excessive exercise or taking diet pills. Additionally, although some had expressed concern that the BMI report cards might give rise to weight-related teasing, no such increases were observed (Raczynski et al. 2009).

## Federal-, State-, and District-Level School Policies

To change the school nutrition environment, action must be taken at the federal, state, and district levels. At the federal level, efforts have been made to improve the nutrition standards for school meals. For instance, the U.S. Department of Agriculture (USDA) released a number of planned changes to school meal programs in 2011, including setting a maximum number of calories per meal (rather than just a minimum), increasing the amount and variety of fruits and vegetables offered, and reducing the amount of total fat and saturated fat in meals (U.S. Dep. Agric. Food Nutr. Serv. 2011). Additionally, federal legislation now gives the USDA jurisdiction not only over federal meal programs, but over competitive foods as well, marking an important victory for the improvement of school nutrition.

State-level policies may hold great promise for improving the school nutrition environment, given that many states impose regulations that exceed those put forth by the federal government. Nearly half of all states have implemented nutrition standards above the federal requirements, and over half have enacted standards for competitive foods, such as prohibiting items from being sold at certain times of the day and limiting competitive beverages to water, milk, and other low-calorie options (Trust for America's Health 2009).

Change at the district level is also critical for the regulation of the school food environment. For instance, in 2004, Congress mandated that all school districts develop school wellness policies, which include creating standards for physical activity and ensuring that all nutritional standards meet or exceed those put forth by federal guidelines (Public Law 108-265). However, there is much work to be done, especially considering that currently no district policies prohibit the availability of competitive foods in middle schools and high schools. Only 22% of students attend school in a district that requires competitive foods to comply with the district's nutritional standards (Chriqui et al. 2010).

Well-designed and executed school health and wellness policies can yield impressive results. More specifically, policies targeting nutrition and exercise in tandem may be the most effective at preventing childhood obesity (Brown & Summerbell 2009, De Bourdeaudhuij et al. 2011). In particular, the Centers for Disease Control and Prevention has recommended that schools designate a health coordinator, focus on providing and strengthening nutrition education and physical education, implement specific physical activity guidelines, and provide healthful and appealing foods both within and outside of the federal meal program.

## FOOD MARKETING

In 2002, the World Health Organization identified food marketing as a significant risk factor for childhood obesity (World Health Org. 2003). A number of other reviews have examined research on advertising to children and concluded that food advertising leads children to prefer and purchase the advertised food (Hastings et al. 2003, Inst. Med. Comm. Food Market. Diets Children Youth 2006, Story & French 2004). Correlational and quasi-experimental studies have also shown that media viewing predicts unhealthy diets and higher body weight among children (Inst. Med. Comm. Food Market. Diets Children Youth 2006).

In response to the growing body of scientific evidence on the effects of food marketing, government agencies, public health experts, and consumer advocacy groups have called for restrictions on food marketing, particularly marketing targeting vulnerable populations (Brownell & Horgen 2004, Cent. Sci. Public Interest 2010, Fed. Trade Comm. 2007, Inst. Med. Comm. Food Market. Diets Children Youth 2006, Nestle 2006). Action is critical considering that the food industry spends billions of dollars each year marketing food to young people, and the majority of food advertisements promote calorie-dense nutrient-poor products (Harris et al. 2009a, Inst. Med. Comm. Food Market. Diets Children Youth 2006, Stierer et al. 2010).

Despite calls for reductions in marketing to youth, children are still exposed to massive amounts of food advertisements through a variety of media outlets. The fast food industry alone spent $4.9 billion promoting its products during 2009, and preschoolers, children, and teens saw significantly more fast food advertisements in 2009 than in 2003 (Stierer et al. 2010).

### Types of Food Marketing

The increasing volume of advertisements is due in part to the growth in the number of techniques and media used to market food. Television is still the most widely used outlet for advertising food to youth. Children view approximately 15 food commercials every day (Fed. Trade Comm. 2007). Product placement is another more traditional marketing form that involves product appearances within television shows, movies, video games, and music lyrics. Products or brands appeared in 69% of the top 20 U.S. box office movie hits from 1996 to 2005, and most of the products shown were energy-dense, nutrient-poor foods and beverages (Sutherland et al. 2010b). One study found that children exposed to soda product placement in a movie clip were more likely to select the brand shown than were children who saw the same clip without the soda product placement (Auty & Lewis 2004).

Licensed characters such as SpongeBob and Dora the Explorer are placed on packaged foods to appeal to young children; SpongeBob alone has 700 licensing partners worldwide (Hampp 2009). Children are also targeted in the school environment through branded vending machines, fundraisers, company logos on team facilities, and television and radio advertisements aired during school hours. Finally, sports sponsorships and endorsements by professional athletes, movie stars, and music artists may be a particularly influential form of marketing given that companies are willing to spend millions of dollars every year on contracts with sports organizations and celebrities (Gomstyn & Arnall 2009, Int. Olympic Comm. 2010, Natl. Colleg. Athlet. Assoc. 2010,

Till & Busler 2000). One study showed that parents were more likely to perceive a food as healthier and were more likely to report wanting to purchase it if it was endorsed by a professional athlete (Dixon et al. 2011).

Newer forms of marketing have experienced significant growth and aggressively engage youth in novel ways. Advertisers' shift toward digital marketing has ushered in new marketing tactics, called stealth, guerilla, and viral marketing, that encourage youth to actively engage with companies through cell phones and the Internet (Chester & Montgomery 2007). For example, food and beverages companies use social media outlets such as Facebook, YouTube, and Twitter to encourage youth to promote products and brands to their peers. Users are invited to post videos of themselves with products, enter contests, and can become a "fan" of brands on their profile. Mobile marketing reaches youth directly through their cell phones, offering coupons for nearby restaurants and prizes when youth text codes appearing on product packaging. Advergaming is another highly interactive form of advertising in which the game itself is built around the brand, its products, and spokes-characters (Moore 2006). In an analysis of advergames and online food marketing to youth, the Kaiser Family Foundation found that 85% of food and beverage brands assessed in the study had Web sites that target or appeal to children (Moore 2006). Most of the products shown on these child-targeted gaming Web sites promote unhealthy foods (Lingas et al. 2009). These forms of advertising are especially potent because today's youth are more integrated with digital technology than were previous generations, companies are better able to track youths' preferences and physical location, and the highly interactive nature of these techniques blur the line between advertising and entertainment.

## Effect of Food Marketing on Consumers

Food advertising affects children's preferences, purchase decisions, and consumption (Hastings et al. 2003, Inst. Med. Comm. Food Market. Diets Children Youth 2006, Story & French 2004). A widely cited review conducted by the Institute of Medicine (IOM) concluded that food advertisements influence children to specifically prefer and request calorie-dense, nutrient-poor foods and beverages (Inst. Med. Comm. Food Market. Diets Children Youth 2006). Exposure to food advertisements can also lead to increased food consumption among youth (Halford et al. 2004, 2007; Harris et al. 2009b). Consumers are also influenced by advertising and labels on product packaging. For example, health claims on food packaging can promote overestimation of a product's healthfulness (Andrews et al. 1998, Schuldt & Schwarz 2010) as well as increased consumption of the product (Wansink & Chandon 2006). Children even think identical foods taste better when the product's packaging features a licensed character (Roberto et al. 2010a) or McDonald's logo (Robinson et al. 2007). This is particularly concerning because children are especially vulnerable to food marketing (Harris et al. 2009c, Inst. Med. Comm. Food Market. Diets Children Youth 2006), and children younger than age 8 are unable to understand that advertisements are meant to be persuasive (Kunkel et al. 2004).

## Food Marketing Policies

Efforts to restrict food marketing targeted to youth have involved government regulation as well as voluntary pledges developed by food companies. In 1974, the advertising industry developed the Children's Advertising Review Unit, which issued guidelines for marketing responsibly to youth under age 12. Although the guidelines do not specify nutrition criteria requirements for food advertisements, the group issued a report in 2004 that claimed their guidelines "adequately address the advertising of food to children" (Natl. Advertis. Rev. Counc. 2004). These conclusions contradict research demonstrating that child-targeted food advertisements for unhealthy foods are highly prevalent and contribute to the childhood obesity epidemic

(Harris et al. 2009a, Inst. Med. Comm. Food Market. Diets Children Youth 2006, Stierer et al. 2010).

The food industry has responded to criticism of its marketing practices by implementing self-regulatory initiatives, namely the Children's Food and Beverage Advertising Initiative (CFBAI), which claims to modify the products shown in food advertisements in an effort to encourage healthier dietary choices and lifestyles among youth (Better Business Bur. 2010). However, reports have concluded that the CFBAI pledges include significant gaps that have resulted in few improvements in the food marketing landscape since inception of the pledges in 2007. The Center for Science in the Public Interest issued a report card in 2010 that graded food, beverage, and entertainment companies on their food marketing policies, and the majority of companies received unsatisfactory grades as result of their weak or absent policies (Cent. Sci. Public Interest 2010). Despite its shortcomings, the CFBAI program announced that participating food and beverage companies issued an agreement in 2011 to follow a uniform set of criteria for advertising to children under 12 years of age (Better Business Bur. 2010). Although the establishment of uniform nutrition standards for advertisements is a step in the right direction, CFBAI has been largely unsuccessful in improving the food marketing landscape.

Several global health-advocacy organizations have that stated self-regulation is not sufficient and have suggested the development of international food marketing policies to reduce the impact of food marketing to youth (Lobstein et al. 2011, Swinburn et al. 2008). A number of countries have regulations limiting or banning food advertisements that target children (see Hawkes 2007). Local governments have also worked to reduce food marketing to youth. In California, the cities of San Francisco and Santa Clara recently passed ordinances requiring children's meals at restaurants to meet certain nutritional standards if a toy is to be included (Bernstein 2010). Importantly, the California Restaurant Association tried to sway public opinion and prevent regulation with an advertising campaign demonizing politicians who supported the measures. Furthermore, food industry lobbyists supported successful efforts to prevent similar ordinances from being enacted in Florida, Arizona, and Nebraska (Bernstein 2011). The food industry's strong resistance to these ordinances suggests measures like these may be effective in improving dietary choices or in helping the public health community gain momentum in the battle to reduce food marketing to youth.

## Challenges and Future Directions in Food Marketing Regulation

A number of challenges exist in the struggle to address the marketing of food to youth. Various countries, food companies, and researchers differ in how they define children (Lobstein et al. 2011). Similarly, many food companies base their self-regulatory marketing policies on the percentage of children who are exposed to a given form of media, despite the fact that many forms of media dominated by adult viewers are also viewed by significant numbers of children. Furthermore, voluntary pledges by the food industry vary in the nutrition criteria used to determine which foods can be marketed to youth. Finally, it will be important to determine which forms of media should be included in food marketing restrictions, especially media streamed in from other countries via the Internet and satellite television.

Self-regulatory efforts made by the food industry have been largely insufficient in improving the food marketing landscape. Youth-targeted food marketing is increasing, and the industry is constantly developing new techniques to engage youth through their cell phones, the Internet, schools, sporting events, television, and celebrity endorsements. Advertisements encourage consumption of calorie-dense, nutrient-poor products and thus undermine parents' ability to assist their children in making healthy dietary choices. Government regulation may be necessary to help protect youth from the effects of food marketing. These

regulations should involve a uniform set of standards delineating the specific nutrition criteria required for foods shown in advertisements and should clearly define the age of a child as well as forms of media that should be regulated.

## FOOD LABELING ON PACKAGES AND IN RESTAURANTS

Food labeling is an important way to provide consumers with accurate information so they can make informed decisions. In 1993, the Nutrition Labeling and Education Act (NLEA) was passed, requiring all packaged foods to display the Nutrition Facts Panel. However, the NLEA excluded restaurants and did not provide guidance about nutrition information appearing elsewhere on food packaging, such as front-of-package (FOP) nutrition claims and labels (Nutr. Label. Educ. Act 1990).

### Front-of-Package Nutrition Labeling

Many different FOP nutrition labeling systems exist, including numerous industry-initiated systems in the United States, a Multiple Traffic Light (MTL) symbol in the United Kingdom developed by the Food Standards Agency (2010), and the "Choices" checkmark symbol (2010) used by food manufacturers in a number of countries.

The lack of a uniform FOP labeling system makes it difficult for consumers to make quick and accurate decisions regarding the nutritional profiles of foods. Each labeling system is also based on a different set of nutrition criteria, which in some cases can be manipulated by the industry to make products appear healthier. When consumers are pressed for time, they are more likely to use heuristic-based decision making, which makes them vulnerable to labels that highlight healthy aspects of an overall unhealthy product (Schofield & Mullainathan 2008).

The U.S. debate about FOP food labeling came to a head in August 2009 when the food industry released the Smart Choices Program. The Smart Choices FOP system was a single-summary checkmark symbol that appeared on foods that were deemed by the industry to be "better for you." Products qualified for a Smart Choices symbol if they met nutrition criteria developed by a team of individuals comprising scientists, academics, public health and nutrition educators, and members of government and the food industry (Lupton et al. 2010).

The program came under immediate fire from the media when products such as Froot Loops and Hellman's mayonnaise carried the Smart Choices logo (Neuman 2009). After the system's release, the Food and Drug Administration (FDA) sent a letter to the Smart Choices program indicating it would be closely monitored (Taylor & Mande 2009), and Connecticut's Attorney General announced that his team would begin investigating whether the label was misleading consumers (2009). Shortly thereafter, the FDA announced an FOP labeling initiative that would engage members of the food industry as well as the IOM and other nutrition experts to provide recommendations for a uniform FOP labeling system that could be adopted by industry. The Smart Choices program discontinued operations following the criticism of the program and the subsequent FDA announcement about its labeling initiative (Metcalfe 2009).

The IOM has since released the first of two reports on FOP labeling (Wartella et al. 2010). However, in the spring of 2011, in advance of the IOM's second report, the Food Marketing Institute and Grocery Manufacturer's Association introduced a Nutrition Keys FOP labeling system (2011). The Nutrition Keys symbol provides information about calories, saturated fat, sodium, and sugars per serving as well as percent daily value. The label also highlights up to two positive nutrients (i.e., potassium, fiber, Vitamin A). The implementation of a uniform FOP labeling system is a step in the right direction, but the timing of the system's release and the labeling approach used has been criticized by public health experts (Brownell & Koplan 2011). There are a number of concerns about the Nutrition Keys symbol, including icons that provide information about grams and

milligrams accompanied by percent daily values despite research indicating that people find percentages on FOP labels confusing (Gorton et al. 2009, Kelly et al. 2009, Lando & Labiner-Wolfe 2007, Malam et al. 2009, van Kleef et al. 2008). The system also allows the industry to highlight positive nutrients, which can often make unhealthy products appear healthier.

The research on FOP labeling systems is limited and has produced mixed results. Currently, the Multiple Traffic Light label developed in the United Kingdom has the most consistent support for its use (Hawley et al. 2011). There is also growing body of research in support of the Choices logo implemented in the Netherlands (Hawley et al. 2011). In addition, research on shelf-tag labeling systems such as Guiding Stars (Sutherland et al. 2010a) and the Special Diet Alert indicates that the systems have increased the sales of the foods promoted by the labels (Levy et al. 1985). Given the importance of having an informative FOP system that is not misleading, more research is needed to evaluate and compare existing systems and their underlying nutrition criteria. In addition, it remains to be seen whether industry can successfully implement a uniform, easy-to-understand FOP labeling system that is based on appropriately stringent nutrition guidelines without government involvement.

## Menu Labeling

In addition to nutrition labels on packaged foods, another way to inform consumers is by providing calorie information on the menus and menu boards of chain restaurants. New York City was the first city to implement menu labeling legislation in 2009, after the restaurant industry pursued two unsuccessful lawsuits to stop the regulations. Menu labeling has been introduced in several U.S. cities and states and will be implemented nationally as part of the Patient Protection and Affordable Care Act (Nutr. Label. Stand. Menu Items Chain Restaur. 2010).

Menu labeling is supported by a solid, research-informed rationale (Roberto et al. 2009) and has considerable public support as indicated by national and local polls (Cent. Sci. Public Interest 2009, Rudd Cent. Food Policy Obesity 2008, Technomic 2008). The few existing studies on menu labeling have produced mixed results, suggesting more research is needed. Two observational studies examining purchasing patterns in New York City and Seattle before and after the implementation of menu labeling did not see a difference in the calories ordered by chain restaurant patrons (Elbel et al. 2009, Finkelstein et al. 2011). In contrast, results from a larger study in New York City that included more chain restaurants found that calories purchased by patrons at some restaurants decreased after menu labeling was introduced (Dumanovsky et al. 2011). Research conducted with data from Starbucks also observed a decrease in calories ordered post menu labeling (Bollinger et al. 2011). In addition, an intent-to-purchase study of menu labeling found that parents ordered fewer calories for their children when making meal selections from menus with calorie information (Tandon et al. 2010). In a randomized, controlled, lab-based study, adults ordered and consumed fewer calories at a dinner meal and after the meal when calorie labels accompanied by a statement about daily caloric requirements appeared on the menu (Roberto et al. 2010b). Although additional research on menu labeling is needed, the extant literature suggests that it promotes lower-calorie choices for some customers.

## Food Labeling and Product Reformulation

FOP and menu labeling might persuade certain consumers to make lower-calorie choices, but the hope is that it will also encourage food companies to reformulate products, either through calorie reduction or portion control. Examples from other labeling regulations suggest that reformulation is likely to happen if the right system is adopted. For example, the fat content in many products was reduced after the passage of the NLEA (Mayer et al. 1998).

Similarly, levels of trans fat were reduced in products following the FDA mandate that trans fat be included on the Nutrition Facts Panel (Eckel et al. 2007). The Tick FOP symbol in New Zealand was credited for prompting the reduction of 33 tons of salt in the food supply through product reformulation (Young & Swinburn 2002), and the Choices FOP symbol in the Netherlands has also promoted product reformulation and the introduction of new products meeting Choices nutrition standards (Vyth et al. 2010). These examples suggest that strategies such as FOP food and menu labeling will be able to improve public health not only by shifting consumer behavior, but perhaps more importantly by encouraging widespread industry product reformulations.

## TAXES AS A MEANS OF CHANGING NUTRITION

There is a history of using tax policy to affect behaviors that in turn affect health. High taxes on cigarettes and alcohol are classic examples, but gasoline and other environmental taxes can also be considered. More than 20 years ago, the idea of taxing unhealthy foods was proposed, but the concept did not enter the legislative and public limelight until 2009.

In 2009, there was a grave concern at all levels of government about high rates of obesity and the resulting healthcare costs. In addition, the struggling economy forced legislators to consider new means of generating revenue to meet the basic needs of government. Food taxes, more particularly taxes on sugar-sweetened beverages, began to be considered seriously by public officials. Two papers published in 2009 gave a public health and economic rationale for such taxes (Brownell et al. 2009, Brownell & Frieden 2009).

The most common proposal has been an excise tax of a penny per ounce for any beverage with added sugar, with some or all of the revenue to be used for obesity prevention programs. An excise tax is preferable to a sales tax, as the price would be added before the consumer makes the decision to purchase a product and there would not be the incentive to purchase large containers.

Currently, a number of states have small taxes on sugar-sweetened beverages, but in all cases the taxes are in the neighborhood of a 5% increase in price, too small to affect consumption (Fletcher et al. 2010). Estimates are that prices must increase 10% to 20% in order to effect substantial changes in consumption (Andreyeva et al. 2010). Thus far a penny-per-ounce or more tax has been considered in a number of states and cities, but none has been passed into legislation. As with tobacco taxes, it is not unexpected that fierce opposition by industry would lead to initial defeats for public officials who introduce such taxes, but as the idea becomes more normative, taxes will begin to pass and will become routine.

It is also possible that the United States will be influenced by taxes passing in other countries. Taxes on either sugared beverages or unhealthy foods of some sort have been passed in Denmark, Hungary, and France and are being considered in a number of other countries.

## SUMMARY AND CONCLUSIONS

Given the prevalence, serious complications, and resistance to treatment of obesity, prevention becomes a high priority. Treatment has a role in providing needed help for individuals afflicted with the problem, but prevalence and therefore the overall public health impact must be addressed through public policies that change the environmental defaults that foster poor eating and physical inactivity. The United States and other countries have shifted from medical to public health models in confronting high rates of obesity. There is increasing concern over food marketing, sales of unhealthy foods in schools, and food labeling practices by the industry, among other issues.

The food industry features prominently in any discussion of policy. Much like the tobacco industry, which under serious threat of government intervention argued that it could police itself and that self-regulation would be sufficient, the food industry is in all-out pursuit of

the public trust. It has pledged to remove its unhealthy products from schools and to market fewer unhealthy foods to children, in addition to a variety of other promises. Whether the public and elected officials find the industry trustworthy will determine in part how aggressive government will be in regulating industry practices.

Thus far the industry has not had an impressive record (Brownell & Koplan 2011, Brownell & Warner 2009, Sharma et al. 2010). The Smart Choices program, aborted by the industry scarcely six weeks after it was launched, is one example of the industry abusing the public's trust. The Nutrition Keys program appears to be another example. In addition, although the industry has promised to market fewer unhealthy foods to children, reports released recently have suggested that marketing is increasing.

The interest in public policies to address obesity is relatively recent; hence, there is an insufficient base of knowledge to identify with certainty which policies will be most effective. Models can be developed and estimates can made on the expected impact of policy changes, but in the case of most approaches, the true impact can be known only when policies are enacted and then evaluated. It simply will not be possible to have completely definitive scientific proof that a policy will work before it is implemented.

Government has a rightful role in addressing nutrition-related problems. This role is accepted and is evident in the regulatory authority of agencies such as the USDA, the FDA, and the Federal Trade Commission. There has been a long history, however, of government agencies acting in ways that protect the ability of the industry to market and formulate its products in a manner that encourages unhealthy eating. With industry self-regulation appearing to be not effective, government has become increasingly involved in constructive ways at local, state, and federal levels. This offers great hope for the future.



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